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Diminishing Manufacturing Sources and Material Shortages: Solutions to Obsolescence in Microcircuits

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ABSTRACT

Why are we experiencing major Diminishing Manufacturing Sources and Material Shortages (DMSMS) problems in semiconductors and microcircuits? I contend that a noted Defense Acquisition expert, Dr. Jacques Gansler in Defense Conversion, correctly notes; ' The government has mandates specialized specifications, standards, procurement and accountability practices, etc., forcing its electronics supplier's plants to be largely isolated from the company's commercial operations. As a result, five of the top ten US semiconductor producers have stated that they refuse defense business because of the burdens and special requirements the government imposes. Thus, the military pays a high price for small quantities of electronic equipment that often include obsolete processes, parts, and software. Clearly, this area is crying out for a change in the way that defense does business.'[1]

I will assess the state of the DMSMS program and attempt to determine how the number of potential obsolescence situations in Department of Defense (DoD) electronics and semiconductor requirements can be minimized. My assessment begins with a detailed discussion of DMSMS to include how obsolescence problems are identified; DMSMS organization development and research sources; DMSMS case verification process, item analysis and problem resolutions. I will conclude with the current Department of Army, Office of Secretary of Defense, and Joint Office of Naval Research/Navy Supply Systems Command (NAVSUP) Small Business Innovative Research initiatives, to include my selection of the initiative that I consider to be most successfully implemented.

My assessments will include a discussion of the current macro-economic assessment of DMSMS in the semiconductor and electronics sector, the shrinking supplier base, the declining DoD budgets impact on the semiconductor vendor base, and the NAVSUP VisiCom, Inc. contract for Rapid Rehosting and Retargeting of microcircuits and semiconductors.

Diminishing Manufacturing Sources and Material Shortages

by

Bonnie L. Pyett Seminar 13

DMSMS is defined as the loss or impending loss of manufacturers or suppliers of items or shortages of raw materials.[2] Within DoD, a DMSMS case can be identified at any stage in the acquisition cycle, from design development through post-production. The potential to impact weapon system supportability, life cycle cost, and fleet readiness can be severe. The majority of DMSMS cases have historically been in the electronics area (primarily microcircuits). However, DMSMS situations and problems affect all weapon systems and material categories.[3]

In order to appreciate the magnitude and complexity of this problem, a more detailed discussion of DMSMS is warranted. DMSMS problems can occur at the piece part, module, component, major equipment, or other upper-level system indenture within a weapon system platform. While rapidly changing technology drives many DMSMS cases, some cases can be attributed to increased foreign competition, federal environmental and safety regulations, and or limited availability of selected materials.[4] A recent GAO report, Defense Inventory Extent of DMS Problems Still Unknown, 95-85 April 1995, identified DMS as a major potential problem.[5]

The GAO report attributed the problem in electronics and microcircuits to radically changing technology, decreasing demands due to DoD downsizing, and emphasis on

DOD using commercial-off-the-shelf (COTS) items. I contend that while this may be true, DOD procurement practices and the declining DoD budget further compound the DMS problem. DoD acquisition and procurement processes are lengthy and time consuming from design through the acquisition lead-time. 'Service life extension programs, generally extend support requirements from 25 to 30 years, as opposed to the 4 to 7 year support cycles expected for many commercial electronic systems. [6] For example, in 1963 government procurement of integrated circuits accounted for approximately 95% of the market; by 1988 this figure had dropped to 8% (an 87% decrease). The combination of expected extended life cycles and decreased demand has left military systems highly susceptible to obsolescence problems. Why? Because vendors and Original Equipment Manufacturers (OEM) dependent on procurement orders from DoD can not wait for an order every four or five years. Therefore, they exit the defense business and focus on commercial requirements with more steady demand patterns and more profitable return-on-investment dollars.

DMSMS Problem Identification

DMSMS initial alerts may originate from a variety of sources to include manufacturers' notifications to discontinue a part or line of production. In the procurement arena, an alert would be identified in response to a no bid or 'not available' response on parts' orders for manufactured components and a depot

requisition for a repair order. Until 1995, the dissemination of DMSMS alerts and control of information therein were not managed by a single activity. Many problems arose due to promulgation of inaccurate information, duplicate data, and markedly limited visibility and distribution of information. In May 1995, in order to reduce redundancy caused by the myriad sources of information, DoD designated the Government Industry Data Exchange Program (GIDEP) as the central data base for managing DMSMS information and sharing the information among DoD and industry groups.[7]

DMSMS alerts are often initiated by the OEM, prime weapon system manufacturer, or subcontractor via letter or phone call. Manufacturers generally notify only their known customers on a particular part. Suppliers often pass information to the government in cases where we are not a direct purchaser. In most cases, DMSMS alerts are originated by the OEM when a component manufacturer contract can not be filled because a vendor or subvendor has provided them a discontinuance notice on a part within the contracted component.[8] Often, the appropriate requirements and clauses for system support are omitted from the production contracts. Therefore, when the DMSMS notice is received, it may be too late to respond effectively.

Defense Supply Center, Columbus (DSCC) Ohio is the primary point of contact for DMSMS alerts with an immediate response time requirement. DSCC initiates an initial alert message to all users to request identification of Life of Type (LOT) buy support,

and funded requisitions or MIPRs for additional hardware support requirements. DSCC alerts have a very short lead-time for response and are frequently promulgated before research to identify alternate sources of supply can be completed.[9]

Military Parts Control Advisory Group (MPCAG) alarms are DSCC alerts distributed in letter format to advise users of planned production discountenances by manufacturers of parts having military applications. A unique difference in MPCAG and DSCC alerts is the MPCAG alert does not provide user information. The DMSMS case verification process begins as soon as possible. First, to ensure that the alert is valid; and second, to evaluate the impact on all affected weapon systems. For example, some notices may indicate a manufacturer as the 'last known source of supply' when in fact other sources exist. Therefore, analysts within the case verification process must carefully validate case information prior to proceeding with full investigations. The case verification, investigation, and resolution process is lengthy and time consuming while ensuring that all possible alternatives are considered and identified to the affected customers.

'Initial resolution alternatives must be fully considered during the investigation process. DMSMS Information may be collected to support one of the following options:

o the manufacturer agrees to continue production for the expected life of system service;

o an alternate source is located who produces the exact same part with same generic part number, meeting the same specification;

o or an alternate part is identified that satisfies the form fit and function of the DMSMS part and meets the same specifications.

Historically, at some DOD activities, the success rate for finding suitable alternate parts was reported to be as high as 80%.[10] Now, let's examine the DMSMS macro-economic impacts and the relationship between DMSMS and the Defense Priorities and Allocations (DPAS) Program.

DMSMS Macro-economic Impact

In cases where a production discontinuance has the potential to delay delivery schedules and thereby impact national security requirements, the DMSMS analyst may consider application of the Defense Priorities and Allocations System (DPAS). DPAS procedures authorize the President of the United States to:

- o require acceptance of defense contracts and orders;
- o require priority performance on defense contracts and orders;
- o control scarce and critical materials essential to national defense;
- o allocate materials and resources to promote national defense;
- o and direct distribution of materials essential to national defense.[11]

DPAS can not be used as a means of defusing difficult DMSMS problems. Additionally, not all systems and equipment are subject to DPAS guidelines. 'DPAS ratings can not be applied to items that do not directly support logistics, tactical or operational program requirements (e.g., administrative type items, liaison vehicles, personal clothing). Specific criteria must be met and documented prior to approval of a request for special priority assistance. The requesting activity must demonstrate existence of at least one of the following criteria:

- o special need for assistance;
- o reasonable applicant effort;
- o timeliness of request submitted to allow for resolution;
- o or assurance that the request does not seek resolution of a technical problem, price advantage, unnecessary delivery improvement, or enforcement of unacceptable contract terms.'[12]

Defense Priorities and Allocations.....Macro-Economic Impact

The United States commitment in Operation Desert Shield provides a backdrop for analyzing the effectiveness of DPAS. The Department of Commerce's (DoC) primary role in Operation Desert Shield was to support DoD acquisition needs through the DPAS. DoC started application of this authority on 2 August 1990. Representatives from each military department and the Defense Logistics Agency (DLA) submitted (to DoC) a variety of production and delivery problems affecting items required to support

DOD operations in the Gulf. Various types of equipment, of particular concern to the military departments, are included: electronic components, portable secure communications equipment, defense electronic countermeasures equipment, communications equipment, and avionics systems and subcomponents.

DoC actions in support of Operation Desert Shield were essentially the same as normal peacetime activities. However, a higher volume of cases was initiated. Normally, the DoC processed 60 to 70 DPAS cases per year. Desert Shield, now confirmed, was a departure from peacetime operations not only in volume but in phasing. A total of 137 DPAS cases were handled between August 1990 and March 1991. The cases were processed in phases as follows:[13]

Timeframe	# of Cases
Aug 2 - Oct 20, 1990	22 cases
Oct 21 - Jan 7, 1991	33 cases
Jan 8 - Jan 17, 1991	15 cases
Jan 18 - Mar 1, 1991	67 cases

The well established daily working relationships between DoD organizations identifying DPAS cases and DoC personnel contributions attributed to the rapid and effective transition to a higher operating tempo during Desert Shield. DMS and DPAS

are clearly interrelated to provide the necessary executive level commitment in our efforts to retain qualified sources for our urgent military equipment needs.

Is GAO Concerned? Yes.

Based on two detailed GAO reports and numerous complaints within DoD and industry, the DMSMS problems will continue to increase. There is a need for better coordination between DoD and industry to determine the potential for integrated circuit DMS problems. How will DoD continue to be supported throughout our extended weapon system life cycles. As a member of the Land Combat Industry Study, I contend that brief assessment for Tracked Combat Vehicles (TCVs) will illustrate an example of the effect of obsolescence in a critical but declining industrial sector.

DoD Industrial Assessment for Tracked Combat Vehicles

Historically, the DoD spending peaked in 1985. Since that time, total defense spending has declined by 67% in real terms. Many corporations responded to this trend in various predictable ways to include closings, reducing product lines, restructuring, mergers, and abandonment of defense production entirely.[14]

The DoD Industrial Assessment for Tracked Combat Vehicles, October 1995, noted the TCV industry has consolidated from three prime contractors to two: General Dynamics Lima Systems (GDLS) and United Defense Limited Partnership (UDLP). It is generally felt that current (1995) planned, new vehicles, derivatives and upgrades/mod programs, coupled with perspective foreign sales of medium/light vehicles generally would be sufficient to sustain needed prime contractor and suppliers industrial capabilities.[15] According to this report, between 1995 and 2001, Land Combat Vehicle (LCV) annual procurement funding was planned to increase 46% from $1.1B to $1.6B (1995 constant dollars).[16]

DoD planned to spend $9.2B for LCV procurement split about evenly between heavy and medium/light classes. R&D Investment in LCV science and technology seeks to improve performance in five functional thrust areas -- mobility, lethality, survivability, command control and Intelligence, and sustainability (crew matching warfare).[17] Declining vendor base, Diminishing Manufacturing Sources, in electronics which provide command, control, and intelligence functions may impact our efforts to maintain the LCV sector performance. An Army official specifically identified a major DMS concern with the general purpose process card for M1 tanks.

The Defense Budget and Major Contractors

The Office of the Deputy Under Secretary of Defense (Industrial Affairs & Installations) OUSD (IA&I) Industrial Capabilities and Assessments (ICA), enclosure (1). These charts report the Top-Two Thirds of Defense Sales 1987 through 1995, the corresponding Total Defense Sales, and Total Defense Innovative Research and Development (IR&D). This data, complied by the Defense Contract Audit Agency, includes most of the contracts awarded in the respective years. This report clearly shows a concentration of defense contractors that received approximately two-thirds of Total Defense Sales. Lockheed Martin heads the list in 1993 and 1995, in percentage of Defense Sales and Defense IR&D, respectively. If we look closely at this data, in 1995 General Dynamics is in 8th place. The Total Defense Sales for General Dynamics includes all DoD sales, to include LCVs. It is difficult to assess what portions of the 1995 sales were LCV. However, in 1994 General Dynamics Land Systems Division (GDLS) vehicle manufacturing earned $72.5M on sales of $828.9M (approximate Return-on-Investment 9% on sales and 54% on assets). The M1 Tank accounted for approximately one-half of GDLSs total revenues.[18] GDLS operated five TCV facilities. One of these facilities produces TCVs, three produce TCV components,

and the fifth performs design engineering, program management, purchasing, logistics support, and prototyping.[19]

United Defense Limited Partnership (UDLP), formed in January 1994 from the merger between FMC's Defense Systems Group and Harsco's BMY Combat Systems Division earned $95.7M on sales of $1.089M (Return-on-Investment 8.8% on sales and 19.5% on assets). In response to the new partnership and reality of smaller defense budgets, 'UDLP is reducing manufacturing capacity and downsizing its operations to reflect both its new partnership and the reality of smaller defense budgets.'[20] Despite these figures, neither UDLP nor FMC is listed on enclosure (1). It is quite obvious that the tank industry does not garner a major piece of DoD spending for procurement or IR&D. The October 1995 Industrial Assessment for Tracked Combat Vehicles states, 'some contractors, GDLS in particular, have expressed concern about the fragility of the supplier base. GDLS has stated it needs 120 MIA2 upgrades per year to keep its supplier base stabilized and to control costs. As procurements have declined, within the declining DoD budget, some TCV suppliers have exited the business.' DMS cases will most likely continue to increase in the TCV sector.

How does all of this relate to DMS? The DoD Office of Industrial Capabilities Assessments, January 1997 brief, reports both prime contractors, GLDS and UDLP, have reacted to funding reductions with several actions:

- o by consolidating facilities;
- o by reducing personnel;
- o by improving production processes;
- o and by reducing their number of suppliers.

GDLS reduced its' supplier base from 3,000 vendors down to 600. UDLP reduced its' supplier base from 1,250 down to 250. Both companies have restructured their

business relationships with the core suppliers. This discussion is a subset of the Tank Sector industry.

Analysis of the Tank Sector

Jacques Gansler, Defense Conversion: Transforming the Arsenal of Democracy, analyzed four representative sectors for DoD spending. Focusing on the Tank sector, which is exclusively military, he notes that this industry primarily consists of one firm, General Dynamics, running two plants. The Army chose to establish a second plant with the same company instead of creating competition within the industry. 'This approach represents the traditional arsenal model commonly practiced throughout the history of the Army's industrial base.'[21] Monopoly conditions of this sort provide very little incentive for continuous innovative technologies that most likely would generate from normal market competition. Similarly, this condition provides very little if any incentive for the introduction of commercial products into these facilities because they are considered tank arsenals.'[22]

Let us now shift our attention to the obsolescence issue within the tank industry. About half of all DoD military systems rely on microelectronics components that will be phased out very quickly over the next few years. Some defense analysts refer to this obsolescence as a ticking time bomb. Analysts have cited the Multiple Launch Rocket System, and others, among the systems relying on obsolete integrated circuits. While DoD records some specifics on the effects of obsolescence, DoD does not have a comprehensive metric to determine or predict the real scope of the obsolescence problem. A DMSMS prediction tool or model would resolve this dilemma.

I have cited facts to support my contention that the obsolescence problem is growing. To continue, in calendar year 1995, the Defense Supply Center Columbus (formerly DESC) received 6,672 discontinuance notices. A total of 4,139 (62%) was for integrated circuits. It is estimated that one-in-ten parts becomes obsolete each year.

The problem will only continue to increase with weapon systems with a 30 year life cycle now expected to last 40+ years.

The TCV key subsystems and components in the electronics sector include Fire Control and Command and Control Systems. Extended life cycle expectancies will identify OEM vendors who have exited the business. To better understand the interfaces between DMS and the electronics sector, a discussion of the semiconductor industry is warranted.

Electronics (semiconductor industry)

The electronics/computer industry is classified by the United States Bureau of Census as Standard Industrial Classification (SIC) code 36. This SIC includes manufacturers of electrical distribution equipment, household appliances, communications equipment, electrical industrial apparatus, radio and television receiving equipment, and other electrical equipment and supplies. The electronics/computer industry is comprised of five major sectors: telecommunications, computers, industrial electronics, consumer electronics and semiconductors. Many segments are interdependent and share common manufacturing processes. DoC provides the following three-digit breakout for industries in SIC 36:[23]

SIC Code	Industry
SIC 361	Transformers
SIC 362	Motors/Generators
SIC 363	Household appliances
SIC 364	Electrical Wiring and lighting equipment
SIC 365	Household audio and video equipment and audio recording equip
SIC 366	Communications equipment

	SIC 367	Printed Wiring Boards (aka PC Boards), Semiconductors, Integrated Circuits, and Cathode Ray Tubes
	SIC 369	Storage batteries, primary batteries (wet and dry)

The Profile of the Electronics and Computer Industry, Environmental Protection Office of Compliance Sector Notebook Project, September 1995 notes that the electronics/computer industry produces a variety of products to include computer chips and components. However, this EPA project focused on semiconductors and not integrated circuits because integrated circuits are used to produce semiconductors. Most electronic devices manufactured today are multiple devices/circuit chips. Semiconductors, although accounting for only a small portion of total industry sales, are crucial to all electronic products and to the US economy.[24]

Semiconductors account for only a small portion of electronics/computer industry sales and semiconductors are used in various applications to include numerous military weapons systems. Typical functions of semiconductors in military hardware include information processing, display purposes, data storage, signal conditioning, and power handling.[25]

'The US Semiconductor industry has experienced growth since the early 1990s. Although the US continues to be the world's largest consumer of electronics products, as a result of Japan's growth in consumer electronics production, Japan is now the world's largest consumer of semiconductors. The US is the second largest market in the world for semiconductors, with consumption at over $17B in 1990. The five largest US producers are Motorola, Intel, TI, National Semiconductor, and Advanced Micro Devices.'[26]

Electronics....Industrial Base Issues

The 1991 Air Force Systems Command Industrial Base Strategic Plan includes an analysis of 27 electronics companies supporting programs in C3I, Radar, ECM, Navigation and Guidance, Munitions and Space Subsections. Based on their survey data, the strength of electronics/communications industry is considered adequate to support current and proposed production schedules.[27] However, nearly all of the companies surveyed or visited, were operating at levels significantly below full capacity and were in many cases restructuring entities due to a declining defense business base.[28]

This report identified five industrial base concerns:

- o growing business base vs declining production base;
- o low modernization investment;
- o increasing environmental pressures;
- o loss of critical skills;
- o and diminishing manufacturing sources for electronic components.

The report recommended 'improving the DoD electronics parts screening process by DSCC enhancing its' rigorous screening of new electronic designs using an additional life cycle data base (Tachtech or equivalent) that locates each electronic part on its commercial life cycle.'[29] This recommendation responds to DoD concerns identified when a DMS notice is received on a part that can not be tracked back to its lowest application. This often occurs when level 3 technical data packages are not available or provisioning data for piece parts was not procured.

I have examined the DMSMS process, issues, consequences and assertions. Now, I will comment on three DoD DMSMS proactive initiatives and provide my conclusions based on my detailed assessment of the DMSMS problem in microcircuits.

DoD Initiatives....DoD Takes Action

The Navy DMSMS office identified the following information relative to the trend in DoD microcircuit obsolescence rates. Let's take a closer look at the trend. Table 1-1 shows from 1986 to 1993, the number of obsolescence notices increased from just over 2 00 to over 7,000. If this trend continues at the same rate, I project that the number for calendar year will exceed 9,000 notifications for obsolete microcircuits. With our weapon systems life expectancy extensions, this may become more critical than ever anticipated.

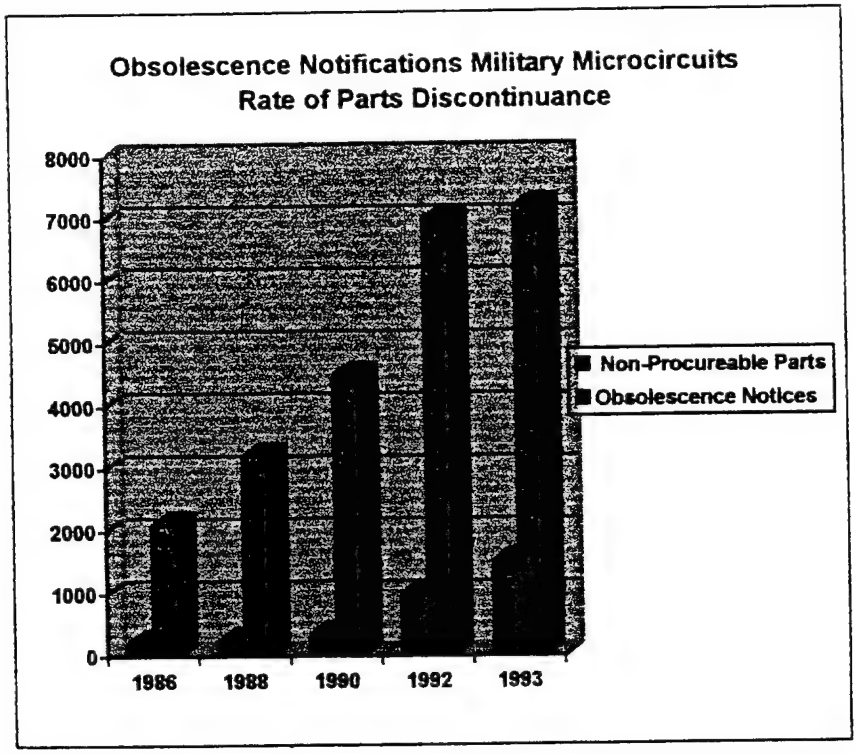

Table 1-1

I contend that more management and planning efforts should be directed toward the development of a DMSMS prediction tool for systems analysis to determine "predict" future microcircuit obsolescence notification trends. This tool may be costly. But the benefits would far out-weigh the costs.

DMSMS WORKLOAD

(Army MICOM Report)

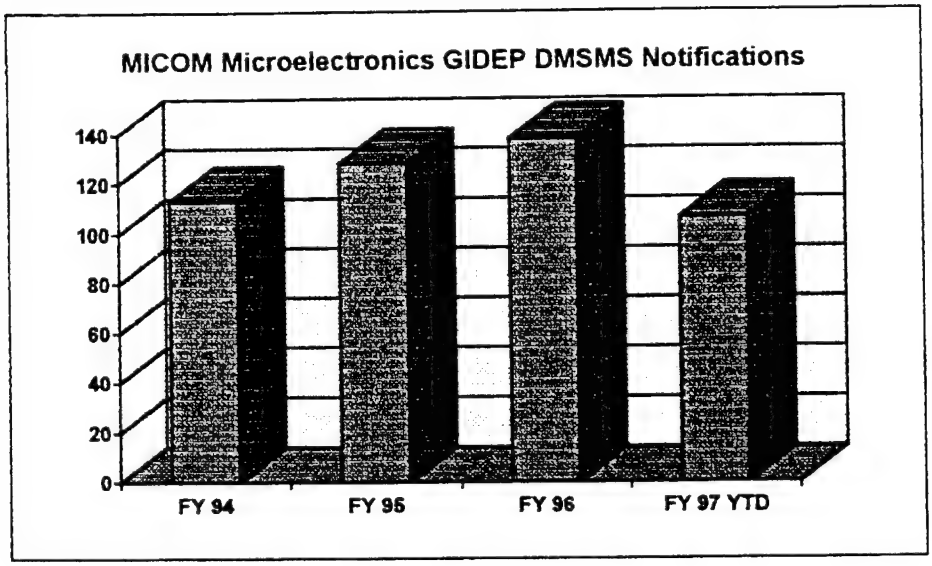

Table 1-2

The US Army Microelectronics (MICOM) Industrial Operations Team provided the statistics on their DMSMS workload displayed in Table 1-2 above. . FY 97 DMS obsolescence effort costs annual budget is $1.25M. FY 98 costs are expected to reach $2.25M. While it appears that the MICOM microelectronics GIDEP DMSMS alerts are increasing, MICOM is proactive in their efforts to alleviate this critical situation. I

applaud MICOMs efforts to track and report the impact of DMSMS obsolescence notifications on Administrative and Procurement Lead-times (ALT/PLT). On five part numbers alone, MICOM estimates the impact on ALT/PLT exceeds 1,000 days at a cost of over $375K. MICOM is exploring smart parts selection, risk analysis, and impact assessments to identify future initiatives.

FY 97 OSD Initiatives

In August 1996, the Deputy Undersecretary of Defense (Logistics) launched the DMS Integrated product Team for Diminishing Manufacturing Sources for Integrated Circuits. This IPT is tasked to identify DMS problems and how DoD will continue to obtain integrated circuits throughout the weapon systems life cycle.[30] The military services will assign two representatives to the IPT with experience in weapon system design in acquisition community. At least one representative should come from science and technology arena or logistics with knowledge in IC design and manufacture. The IPT draft briefing package identified several major DMS issues to include:

- o identification of IC obsolescence trends
- o determination of IC problem e.g., industry wide or DoD
- o determination of why DoD has difficulty obtaining ICs.

Additionally, there are many DoD groups studying the DMS problem. I will cite just a few among them:

- o Sustainment Readiness Working Group (Joint Directors of Labs Manufacturing Technology Panel)
- o Parts Acquisition Reform Team
- o OSD DMS and MS Working Group Subgroup
- o Joint Aeronautical Commanders Group

My discussions with the Navy DMS Working Group component noted DMS problems and solutions are not shared. A more aggressive liaison through intelligent

coordinated management would reduce the overall impact of DMS on our weapon system life cycle costs. Currently, we do not have a Program Element (PE) for DMS solutions. Finally, OSD initiated discussions with DoD components to determine if acquisition reform initiatives will exacerbate DMS problems.

Draft recommendations to the DMS IPT include the following considerations:

o military services should improve their procedures for responding to inquiries for out-year requirements projections on DMS IC notices;

o supply centers may consider limiting issue of DMS parts to components who provided out-year projections;

o determine if a supply source data warehouse on new and fielded systems would resolve difficulties in finding information on ICs substitute candidates.

Small Business Innovative Research (SBIR)

My recommended proactive solution to reduce obsolescence in the LCV sector was contracted by the Naval Supply Systems Command (NAVSUP) in a Small Business Innovative Research (SBIR) contract to VisiCom Laboratories, Golden Colorado. As Jacques Gansler notes in Defense Conversion: Transforming the Arsenal of Democracy, SBIR is a set aside program for small business ventures. SBIR would be more effective if targeted to critical technology areas. [31] The Rapid Retargeting and Rehosting success story documented on this contract, can be applied to microcircuit obsolescence in LCVs.

'Until recently, it was DoD practice to replace individual obsolete devices with alternate source components by using General Emulation (GEM) of microelectronics programs by procuring a customized application specific integrated circuit (ASIC). GEM has enjoyed considerable success, it is expensive, and short term. GEM could replace one or two obsolete components to extend board life, while within a few months other

devices become obsolete. GEM may still be applicable within some DoD systems, while a new evolving process called Rapid Retargeting (RRT) has emerged.'[32]

This process was patented by VisiCom Laboratories, a San Diego based company, that provides systems integration, software and hardware development expertise, and special purpose software and hardware products to a number of industrial clients. Specifically, for DoD, VisiCom provides products and engineering services related to: C3I Systems, real-time operating systems, tactical simulation systems, wide and local area networks, and other computer based systems.

'The Rehosting process begins by extracting the 'functionality' of the target hardware and capturing it in VHSIC Hardware Descriptive Language (VHDL). The resulting software modules are 'simulated and compared with original hardware' for verification. Once verified, modules are 'ported to a new hardware design.' Subsequently, part's obsolescence is no longer an issue.'[33]

In the LCV sector, this technology could be applied to various electronics modules within Fire Control and Command and Control Systems, to extend their service life and, whenever new technology becomes available, these software modules could be rehosted to include the new technology. VisiCom has successfully rehosted several Standard Electronic Modules (SEMs) into common hardware components to produce UniSem. Universal hardware design can replace 26 or more of the keycodes in a system like the UYK-44. UniSEM is manufactured using single module design that employs Field Programmable Gateway Arrays (FPGAs). The SEM is personalized to replace a specific board type by programming the FPGA either in production, at the depot, or in the field.

RRT was developed by VisiCom to address opportunities created by the DoD decision to use COTS in military applications. VisiCom transferred a proven commercial design into a product that satisfied military standards for rugged

environments, like Land Combat Vehicles, without incurring DoD tradition of long lead-times

Conclusion

In this paper, I examined the DMSMS program and processes. I discussed the DMSMS problem identification, DMS alerts, DSCC and MCPAG roles within the DMS process. I discussed the DMSMS and DPAS relationship in detail while addressing specific GAO concerns with DMS problems.

I outlined my assessment of the impact of the declining DoD budget on the electronics supplier industrial base for military parts applications. This assessment was supported by an analysis of the Tank (Land Combat Vehicle Industry) sector and the concerns identified by the Office of Economic Security, Industrial Capabilities Assessment.

My paper concludes with a discussion of three current initiatives in the DMSMS arena. First, the Army MICOM initiatives to reduce the number of DMS cases in microelectronics. Second, the OSD initiative establishing an IPT to address DMSMS in Integrated Circuits. Lastly, the Navy SBIR contract for Rapid Rehosting and Retargeting of obsolete microcircuits to reduce investments in LOT buys.

I included tables displaying graphic information necessary to support my position. DMSMS is critical within our efforts to extend the service life of many of our critical weapon systems. Electronic components will continue to play a critical role in the success of our military throughout the world. While DMSMS can not be eliminated, we must manage and plan for its impact on our future.

[1] Jacques Gansler, Defense Conversion; Transforming the Arsenal of Democracy, 1996, p. 38.
[2] NAVSUP Diminishing Manufacturing Sources and Material Shortages Case Solutions Guide, March 1993, p.1.
[3] Ibid. p.1.
[4] Ibid. p.1.
[5] United States General Accounting Office Report, Defense Inventory, Extent of DMS Problems Still Unknown, GAO Report NSIAD 95-85, 21 April 1995 p.1.
[6] Ibid. p. 1.
[7] OUSD ltr Subj: DoD's Diminishing Manufacturing Sources and Material Shortages Centralized Data Base, 1 May 1995.
[8] Id., note 2, p.2.
[9] Id., note 2, p. 4.
[10] Id., note 2, p. 17.
[11] Id., note 2, p. 24.
[12] Id., note 2, p. 25.
[13] Hutzler, Patricia I., High Value/Low Visibility; Civil Agency Support for Desert Shield and Desert Storm, Logistics Management Institute, FEMA , Mar 1992. p 3-24.
[14] Department of Defense, DoD Industrial Assessment for Tracked Combat Vehicles, Oct 1995.
[15] Ibid., p. vii..
[16] Ibid., p. 32.
[17] Ibid., p. 32.
[18] Ibid., p. 53
[19] Ibid., p. 55.
[20] Ibid., p. 59.
[21] Gansler, Jacques, Defense Conversion: Transforming the Arsenal of Democracy, 1996, p. 33.
[22] Ibid. p. 33.
[23] United States Environment Protection Agency Office of Compliance Sector Notebook, Profile of the Electronics and Computer Industry, Sept 1995, p. 4.
[24] Ibid., p.5.
[25] Ibid., p.10.
[26] Ibid., p 11.
[27] United States Air Force, Air Force Systems Command Industrial Base Strategic Plan, Dec 1991, p. 3-4.
[28] Ibid., p. 3-5.
[29] Ibid., p. 3-6.
[30] OUSD ltr, Subj: Integrated Product Team For Diminishing Manufacturing Sources For Integrated Circuits, 29 Aug 1996.
[31] Id., note 21., p. 179.
[32] Fitzhugh, Gary, Ph.D., Rapid Retargeting As A Diminishing Manufacturing Sources Material Shortages Solution, Abstract, June 1996.
[33] Ibid., p. 4.

Top Two Thirds of Defense Sales-1995	Total Defense Sales (in $000s)	Total Defense IR&D (in $000s)
Lockheed Martin (with Loral)	$ 19,007,341.00	331,332.00
McDonnell Douglass	$ 8,384,802.00	156,510.00
Hughes (with Magnavox)	$ 7,749,702.00	180,040.00
Northrop Grumman (with Westinghouse)	$ 7,070,334.00	151,680.00
Boeing (with Rockwell)	$ 4,733,904.00	149,710.00
Raytheon (with E-Systems)	$ 4,157,972.00	74,275.00
UTC	$ 2,862,686.00	153,128.00
General Dynamics	$ 3,363,061.00	13,202.00
Total	57,329,802.00	1,209,877.00
Total DCAA Defense Sales	**86,906,181.00**	**1,664,624.00**
Top Two Thirds/Total DCAA Defense Sales	**66.0%**	**73%**
Top Two Thirds of Defense Sales - 1993	**Total Defense Sales (in $000s)**	**Total Defense IR&D (in $000s)**
Lockheed	9,873,826	141,999
General Motors	8,460,012	184,604
Martin Marietta	7,855,591	218,078
McDonnell Douglas	7,552,649	109,219
Northrop Grumman	6,709,336	123,043
Raytheon	4,045,000	93,182
UTC	3,339,524	129,025
Boeing	3,058,996	84,199
General Dynamics	2,948,436	13,265
General Electric	2,398,076	78,736
Loral	2,190,413	37,702
Litton	2,122,677	20,844
GTE	1,975,915	23,989
Total	**62,530,451**	**1,257,885**
Total DCAA Defense Sales	**95,023,845**	**1,903,264**
Top Two Thirds/Total DCAA Defense Sales	**65.81%**	**66.09%**
Top Two Thirds of Defense Sales - 1991	**Total Defense Sales (in $000s)**	**Total Defense (in $000s)**
McDonnell Douglas	9,864,142	95,723
General Electric	7,404,557	197,736
General Dynamics	7,337,257	64,238
Lockheed	7,036,602	111,067
GTE	6,692,617	25,552
Northrop	5,601,718	76,827
General Motors	5,368,079	172,288

Enclosure (1)

Raytheon	4,717,227	111,154
Boeing	4,245,513	137,028
Martin Marietta	3,901,690	70,819
Loral	3,327,632	54,555
Grumman Aerospace	3,210,866	49,260
Litton	2,126,786	26,329
Newport News Shipbldg & Drydock	2,112,338	10,344
E-Systems	1,742,985	21,147
Allied-Signal	1,683,991	26,838
IBM	1,255,285	23,881
Total	**77,629,285**	**1,274,786**
Total DCAA Defense Sales	**116,644,458**	**2,203,301**
Top Two Thirds/Total DCAA Defense	**65.55%**	**57.86%**
Sales		
Top Two Thirds of Defense Sales - 1989		
McDonnell Douglas	9,056,145	119,057
General Dynamics	8,335,911	112,301
Lockheed	7,025,961	133,648
General Electroc	6,789,454	150,190
General Motors	5,663,527	162,159
Northrop	4,983,830	91,766
Boeing	4,608,771	105,727
UTC	4,429,117	144,752
Raytheon	4,337,560	100,635
GTE	4,179,066	30,949
Martin Marietta	3,957,709	86,573
Rockwill International	2,923,887	78,261
Grumman Aerospace	2,861,123	53,185
Westinghouse Electric	2,288,547	41,675
Litton	2,204,611	30,688
Honeywell	2,028,938	43,570
Newport News Shipbldg & Drydock	1,848,864	7,781
Total	**77,532,021**	**1,492,917**
Total DCAA Defense Sales	**117,130,229**	**2,233,603**
Top Two Thirds/Total DCAA Defense	**66.19%**	**66.84%**
Sales		
Top Two Thirds of Defense Sales - 1987	Total Defense Sales	Total Defense
	(in $000s)	(in $000s)
General Electric	9,259,532	195,054
Lockheed	8,874,829	149,003
General Dynamics	8,102,570	89,551
McDonnell Douglas	7,718,307	95,313
General Motors	7,619,218	156,656

Northrop	5,950,083	98,766
Raytheon	4,491,661	102,213
Boeing	4,347,977	117,476
Martin Marietta	3,885,554	61,533
Grumman Aerospace	2,657,178	40,560
Honeywell	2,367,844	43,392
LTV Aerospace and Defense	2,259,467	29,635
Allied-Signal	2,042,551	39,539
Litton	2,026,464	30,373
IBM	1,884,200	28,670
Newport News Shipbldg & Drydock	1,619,418	3,565
GTE	1,038,371	22,216
E-Systems	1,003,165	13,076
ITT	997,939	14,847
Hercules	965,893	15,881
Ford Aerospace	957,063	26,127
Morton Thiokol	921,597	5,652
Total	80,990,991	1,379,098
Total DCAA Defense Sales	122,025,605	2,185,377
Top Two Thirds/Total DCSS Defense Sales	66.37%	63.11%